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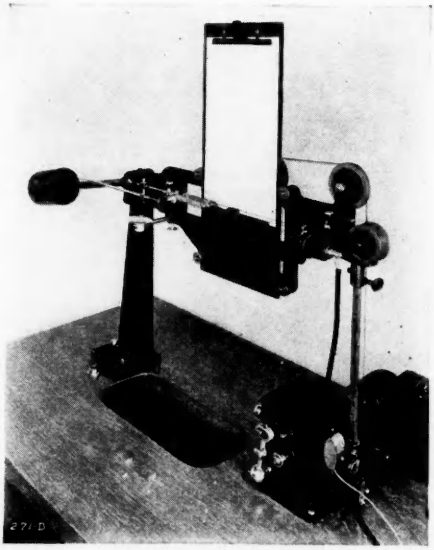

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TESTERS

The Editor's Page

Annual Meeting, Luncheon and Conference

ALTHOUGH the Institute's 10th annual meeting, luncheon and research conference will have adjourned before this issue is received by many members, nevertheless for the information of those who may receive it by Nov. 1, the publication date, and for a matter of record, the final call is published herewith.

As previously noted the meeting and other functions will be held at the Hotel Pennsylvania, New York, N. Y., Thursday, Nov. 2, 1939.

Because of the present unusual demands of business upon the time and talents of Institute members, and textile men generally, it has been decided to omit the usual annual dinner, and to present an unusually important program of three major features concentrated between the hours of 11 A. M., and approximately 4.30 P. M. The major features of this streamlined program are as follows:

11.00 A. M.—Annual Meeting of Members for presentation of reports and election of directors.

12.00 P. M.—Meeting of Directors for election of Officers, Executive Committee, etc.

12.30 P. M.—Luncheon Meeting, open to members and guests, followed by a brief speaking program.

2.00 P. M.—Open Conference on "Wool Processing in the Light of New Knowledge of the Chemical and Physical Properties of Wool."

The Luncheon Meeting

Following the luncheon President Killheffer will present his annual address, and the remainder of the session will be devoted to brief reports of progress of Institute and Textile Foundation researches. Chairman Franklin W. Hobbs of the Foundation will introduce representatives of that research body.

The Open Conference

The research conference starting at 2 P. M. is open to all who are interested in securing up-to-date information as to new knowledge of the chemical and physical properties of the wool fibre, and in hearing or taking part in the discussion designed to indicate whether this new knowledge is being or can be successfully applied. W. D. Appel, chairman of the Institute's Research Council, and Chief, Textile Section, National Bureau of Standards, will preside.

New knowledge of the chemical properties of wool will be presented by Dr. Milton Harris, director of Textile Foundation scientific research at the National Bureau of Standards, and Mr. Werner Von Bergen will outline new discoveries as to the physical properties of the wool fibre. R. A. Lukens, vice-president, Continental Mills, Inc., Philadelphia, will then open the discussion. He is responsible for having suggested the subject, and may be expected to lead the discussion along lines that will be of greatest advantage to the industry.

Directors Whose Terms Expire

The terms of the following directors expire in 1939: J. W. Arrington (deceased), Arthur Besse, H. M. Chase, D. E. Douty, Ephraim Freedman, H. Grandage, Edward R. Schwarz, Chairman Research Council, ex officio.

A director for a term expiring in 1940 must be elected to succeed Philip A. Johnson, resigned.

Committees for Annual Meeting

Committee on Meeting.—Ephraim Freedman, Chairman; A. M. Tenney, D. G. Woolf, C. H. Clark.

Committee on Nominations.—Arthur Beese, Chairman; F. S. Blanchard, Dr. A. C. Walker, D. G. Woolf.

Budget Committee.—Dr. E. H. Killheffer, Chairman; E. N. Hood, C. H. Clark.

* * *

Foundation Research Publicized Effectively

A NOVEL and entertaining method of publicizing scientific and economic textile research to a group of manufacturers, whose interest in such matters is normally difficult to arouse, was demonstrated with success at the annual convention of the National Association of Cotton Manufacturers in Boston, Oct. 18, by the following representatives of the Textile Foundation who were introduced by Chairman Franklin W. Hobbs of the Foundation:

Frederick M. Feiker, general secretary of the American Engineering Council, who has had charge of the Foundation's educational program, and who acted as a sort of interlocutor in this round table presentation.

Warren E. Emley of the National Bureau of Standards, former chairman of the Institute's Research Council, and a member of the Foundation's Advisory Committee on Scientific Research, who by giving outstanding examples of the benefit to industry of basic scientific research, and of the results of basic textile research that should have practical application, aroused the keen interest of his hearers.

Stanley B. Hunt, of Textile Economics Bureau, and member of the Institute's Committee on Economic Research, who assisted Mr. Feiker in his duties as interlocutor, and was adept in leading the discussion of the Foundation's research program at the Wharton School, which program was suggested by the Institute's Committee on Economic Research.

George W. Taylor and Hiram S. Davis of the Research Department of the Wharton School of Finance and Commerce, University of Pennsylvania, who not only told of the progress of the present research on Inventory Policies and Statistical Guides, but of several notable cases in which results of the former research on Vertical Integration in the Textile Industries had been applied satisfactorily.

These knights of the research round table operated in a most informal manner, remaining seated while presenting an assigned topic, and during the following group discussion. Unquestionably this novel method helped to hold the attention of the audience, as did the apt and intriguing stories of Messrs. Feiker and Taylor.

This group had previously appeared in several textile school cities in the South, and had it not been for previous engagements of several of the group it would have appeared at the Institute's luncheon meeting, Nov. 2.

(*Continued on page 21*)

Technical Evaluation of Textile Finishing Treatments

Flexibility and Drape as Measurable Properties of Fabric

By LELIA J. WINN * and EDWARD R. SCHWARZ, F.T.I.**

Introduction

A series of ten fabrics, ranging from organdie through tracing cloth to a thick, stiff-finished cotton material, and varying in weight from approximately 5 milligrams per square centimeter (1.46 ounces per square yard) to approximately 45 milligrams per square centimeter (13.25 ounces per square yard), have been compared for bending length, rigidity, bending modulus, bending torque, chord length and radius of curvature by means of the drape tester, the hanging loop, Gurley stiffness tester and the Schiefer flexometer. The tests were all conducted in an atmosphere closely approximating standard conditions after adequate conditioning of the samples in this same atmosphere.

Summary of Test Methods

THE Gurley stiffness tester was designed to handle paper rather than fabric and is influenced somewhat by the surface roughness of cloth as compared with a smooth paper. Further work may develop a satisfactory technique, but at present the results by this instrument show imperfect correlation with results by other methods.

The Schiefer flexometer has been described in the literature and the results of numerous tests are available. It was used in this investigation because it measures the force necessary to distort a sample (or pair of samples) by bending when the weight of the sample is eliminated by reason of the method of insertion of the sample in the instrument.

The hanging loop test as reported on by Peirce is fully described in the literature and reference has already been made to this in the first report of this series † (see also Fig. 1).

The drape tester was developed at M. I. T. to measure a property which it is not believed has been measured by the other devices. Further details will follow on these latter methods (see Fig. 2).

The test methods in general may be subdivided according as force is measured or as deformation is measured. The external force necessary to produce a known deformation may be measured when the weight of the sample

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** Professor of Textile Technology, M.I.T.
† *Am. Dye. Rptr.*, March 20, 1939, pp. 138. *Text. Rsch.*, Vol. IX, No. 6, pp. 216–30 (1939).

is acting as in the cantilever type of test for measuring the stiffness of yarn or fabric. External force to produce a known deformation may also be measured when the weight is eliminated as is the case with the Schiefer flexometer where the sample weight is taken by the two vanes used in the instrument, or in the Saxl tester * where the weight is balanced out.

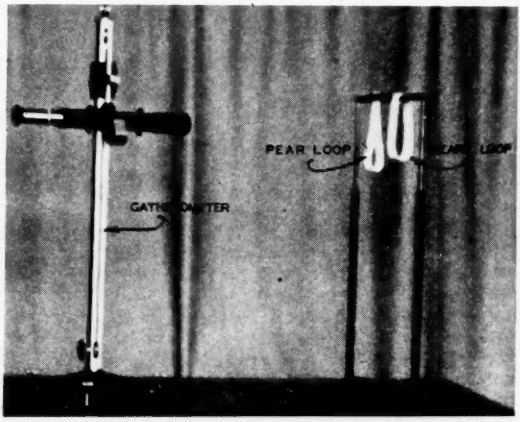

FIG. 1

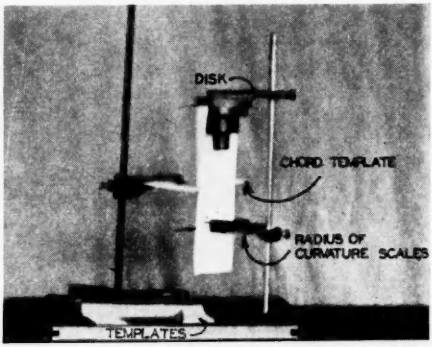

FIG. 2

Where a deformation is measured, the deformation may be produced by the weight of the sample acting directly as in the cantilever test and in the hanging loop test or where the weight is acting indirectly as in the drape test. In the former instances the weight is acting to bend the sample directly about an axis while in the latter instance the weight is acting at right angles to the direction of the distortion. The distinction between "drape" and "flexibility"

* *Rayon Text. Mo.*, Jan. 1938, p. 57.

must be kept clearly in mind. The flexibility of a material is a general term which denotes either the deformation produced by a known force, either external or from the sample itself, as distinct from the drape of the material where the weight of the sample does not act directly to produce the deformation, but rather has an influence on a deformation at some angle to its line of action.

Measurable Quantities

In this connection bending length, rigidity, bending modulus, drape length and corrected drape length are of importance.

The bending length is the length of sample necessary to produce a given deformation of the material under its own weight acting in the manner of a cantilever beam. The cantilever beam is distinct from other types in that it is supported only at one end. Two types of test were used in this investigation to determine the bending length. These were the heart loop (Fig. 1—right) and the pear loop (Fig. 1—left) respectively. The heart loop apparently has certain advantages over the pear loop which make it much to be preferred of the two tests. In the first place the formula for computing the bending length is much simpler for the heart loop than it is for the pear loop. The latter involves an experimental coefficient together with the cosine of a fractional part of the angle of deformation.* Previous work has indicated that the heart loop test was probably more satisfactory for materials which are extremely flexible than for materials which are extremely stiff. On the contrary, the pear loop was found to be more satisfactory for the stiffer materials rather than those which possess a high degree of flexibility. Under the cases so far investigated in this work it has been found that for a wide range of materials, both as to thickness, hardness and stiffness, the heart loop could be used satisfactorily throughout. A further advantage of the heart loop is to be found in the fact that once a specimen length of sufficient magnitude has been determined any increase of the specimen length beyond this does not involve a change of bending length which is at all significant.

Reference to Fig. 3 will show the plot of specimen length against bending length for the pear loop and it will be seen that the resulting curve is closely approximated by a straight line. There is no place where the bending length remains constant over a range of specimen lengths. It would therefore be necessary to limit the length of the specimen of similar flexibility to a definite value in order to have comparable results in the test. It will also be seen that if the proper conversion factors are used with the data for the pear loop test, the values may be corrected to those which would have been obtained had a heart loop been employed. This curve will not agree exactly with the experimental ones but will be a reasonable approximation to it and ordinarily approximately parallel with it. Here it is found that beyond a critical length of specimen there is little if any change in the bending length for further increase of specimen length. Thus, any reasonable length beyond the minimum may be employed without affecting the final result. It should be apparent that the longer the specimen length, the longer the loop will be; hence, the less precision of measurement is required for measuring the actual length of the loop. Thus much simpler and less expensive apparatus can be used for the heart loop test than is possible for the pear loop test. For comparison, reference should be made to Fig. 4 which indicates for the series of 10 fabrics investigated in this part of the work that the bending length remains substantially

* Heart loop: $c = l_4 f_{2\theta}$.
Pear loop: $c = L(0.133) f_{2\theta} / \cos. 0.87\theta$.

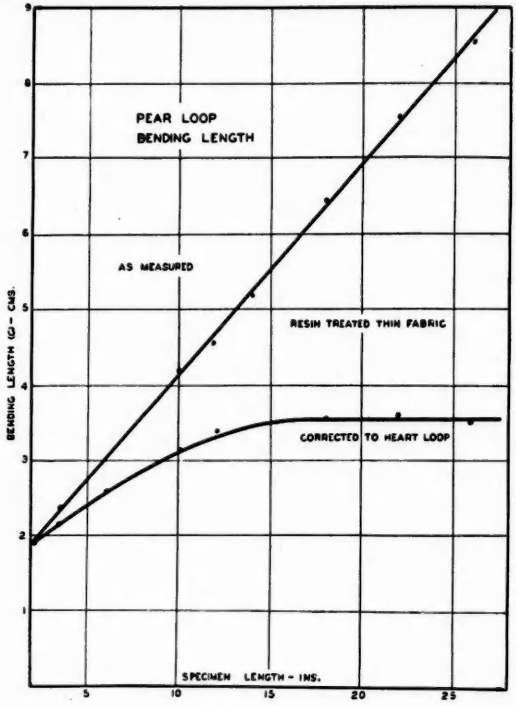

FIG. 3

constant once a specimen length of some 5 to 15 inches is reached. It should be noted that the stiffer materials call for a somewhat longer specimen length then do the more flexible fabrics. However, the sensitivity of bending length to change in specimen length is very much less and the operator is therefore allowed a much greater leeway in his investigation and a higher precision of measurement.

The rigidity of the sample is computed from the bending length by multiplying the cube of the bending length by the weight of the material per unit area ($G = \omega \cdot c^3$). Under these conditions the weight of the sample is taken into account and materials of differing weights can therefore be more satisfactorily compared. The rigidity is a direct measurement of the stiffness of the sample and compares well with measurements of the force necessary to deform the material. This is illustrated by the high Spearman rating (71%) from Table 3.

The bending modulus, on the other hand, is computed indirectly from the bending length by means of the rigidity. It is found by dividing twelve times the rigidity by the cube of the thickness $\left(q = \frac{12G}{d^3} \right)$ and brings the thickness

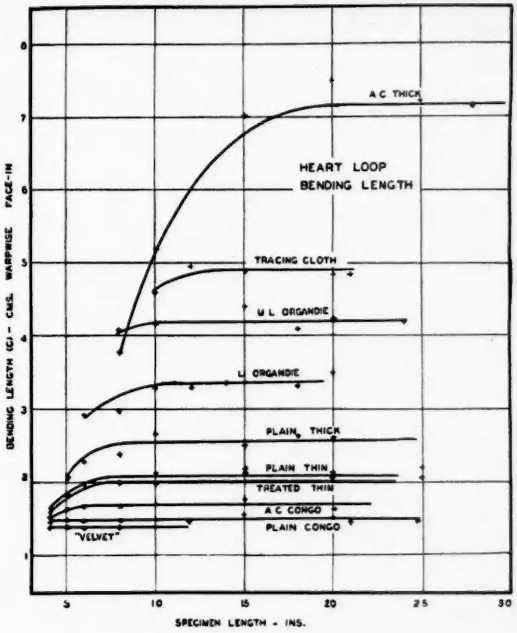

FIG. 4

of the sample and consequently something of its softness or resilience into the picture. It tends to measure the paperiness of the material and a high bending modulus is apt to be an indication of a hard or harsh material.

The Drape Test

The drape length is the length of sample as supported on the drape tester measured from the top of the material to a point such that the length of the chord is a given constant value. The greater the drape length the more flexible the material will be. In order to correct for the effect of weight or determine what the drape length would be for a material of different weight, assuming that they have the same stiffness, we can relate the length as measured to the length desired by means of the weight per unit area of the sample which was measured and the weight per unit area of the sample whose drape length it is desired to determine. The formula takes the form:

$$H_c = L - \frac{W_m}{W_c}(L - H_m)$$

here H_c = the corrected drape length
L = the length of the specimen
H_m = the measured drape length

and W_m and W_c represent the weight per unit area of the sample measured and the weight per unit area of the sample whose properties are desired respectively.

In the drape test where the drape length is determined it is also possible to measure the contour of the lower edge of the specimen (see Fig. 5). If this

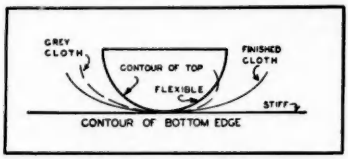

FIG. 5

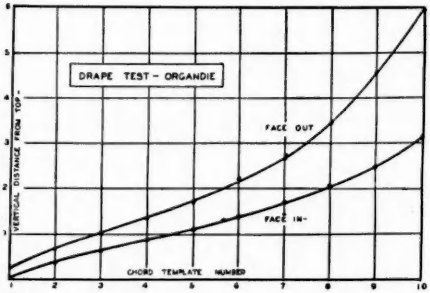

FIG. 6

is a symmetrical curve it can be stated that the stresses set up in the sample are more or less uniformly distributed and therefore that the finishing operations (if any) have had a uniform effect. If fabric direct from the loom is subjected to the drape test it will be found (particularly for woolen and worsted materials) that the bottom edge of the sample assumes a non-symmetric shape. After proper treatment (usually wet finishing), if the finishing has been carried out properly, the curve becomes more or less symmetrical.

Radius of Curvature

If the sample in the drape tester (see Fig. 2) has sufficient flexibility horizontally it will hang in such fashion that, when the top edge is deformed into a half circle by its attachment to the instrument, the bottom edge will likewise form itself into a semi-circle. The radius at the bottom edge or at any other point in the length of the specimen will therefore be constant and equal to the radius of the top circle. If, on the other hand, the horizontal stiffness of the material is such that at any given distance from the top of the sample, or at the bottom edge of a given length sample, the material takes the form of a substantially straight line, the fabric registers the maximum degree of stiffness. The radius of such a line is infinite in length and will decrease from this value rapidly to equal the radius of the circle at the upper edge of the specimen. Because the change is extremely rapid the measure-

ment of radius of curvature becomes somewhat erratic as the bottom of the sample is approached—provided that the material has a reasonable degree of stiffness. It is believed, therefore, that the radius of curvature is not as satisfactory a means of comparing samples as is the chord length (to be described).

However, there may be times when the radius of curvature and its variation along the length of the sample may be of interest and value and it is computed from a knowledge of the length of a given chord and the distance of the center of the curve away from the center of this chord. The formula for radius of curvature is derived as follows where it is assumed that r equals the radius of curvature desired, v is the distance of the curve from the chord at the center of the latter and c is the length of the chord itself. From simple geometry of the figure and from the usual relationship between the sides and hypothenuse of a right triangle we derive the expression

$$(r - v)^2 + \frac{c^2}{4} = r^2.$$

Simplifying, we obtain

$$r = \frac{v^2 - \frac{c^2}{4}}{2v}$$

and in turn

$$r = \frac{4v^2 - c^2}{8v}$$

In the present form of drape tester (which is to be improved in design shortly) the radius of curvature is determined by means of two sliding scales graduated in millimeters, one of which follows along the center line of the disk to which the fabric is attached and the other is spaced a known distance from the first scale. This known distance is equal to $\frac{c}{2}$. It remains only to move the center scale slowly along a groove until the tip of the scale just touches the inner surface of the fabric. The second scale is then pushed forward until it touches the surface of the fabric (Fig. 2—lower right) and the difference in the scale readings is noted and recorded as v. Since the value of c is known and the value of v can be measured at any desired distance from the top of the sample it becomes immediately possible, by substitution in the formula just derived, to obtain the radius of curvature at any distance from the upper edge of the sample. This radius of curvature will either remain constant for a material which is completely flexible and limp, or will increase more rapidly as the stiffness of the sample increases. For comparison of samples it is therefore only necessary to determine a convenient distance from the top of the specimen at which all measurements will be made and to determine the radius of curvature at this point. The greater the radius of curvature, the greater the stiffness of the sample. Because of the rapid increase of radius of curvature for stiff samples as the bottom edge is approached, it is desirable that the distance from the top of the sample be made as small a value as can be done consistent with obtaining readings showing significant differences.

Chord Length

A somewhat more satisfactory technique is available and consists simply of measuring the width to which the sample spreads out as the measuring

device is moved down from the upper edge of the specimen. Obviously this is an attempt to measure the length of the chord instead of the radius of curvature, on the assumption that the stiffer the sample the more rapidly will this width of sample or length of chord increase. Since this value does not approach infinity as one moves down the specimen, but simply varies from the diameter of the circle to which the upper edge of the specimen is attached to the width of the sample which is equal to the semi-circumference of the top circle, there is a steady and uniform increase rather than a sudden change. The curves which are obtained as a result of such tests are therefore somewhat smoother and the individual points lie closer to the curve than is the case with the radius of curvature measurements.

In the present drape tester the diameter of the disk to which the sample is attached is three inches. For simplicity of initial investigation a series of plates were prepared with rectangular openings cut from the long edge in such fashion that the length of this opening varied by 10% of three-inch intervals. This gave a series of increasing chord lengths, each unit of increase being 10% of the original diameter. A number of these templates were prepared and can be numbered in sequence as the opening at the side increases in dimension. These are successively laid on a platform attached to a vertical support on which it is free to slide vertically (Fig. 2—left). As the support is moved down, the template may be brought toward the fabric and eventually the edges of the fabric will pass inside the opening at the edge of the template. The descent of the platform carrying the template is continued until both edges of the sample just touch the inner edges of the template opening. At this point the distance from the under side of the disk to the platform is measured and recorded as the drape length. It therefore becomes a simple matter to measure the drape length which corresponds to a series of chord lengths increasing by 10% increments of the original diameter. If a certain sample shows a greater chord width at any particular height than another sample it is inferred that the first material is stiffer than the second. In similar fashion, if the drape length is less for one material than another the first material is thought to be stiffer than the second.

It will be apparent that the weight acting at any given height (for chord length measurements) will be the weight of the fabric below this level. If, therefore, the drape length be subtracted from the length of the sample we have the length of material acting to reduce the deformation. There will of course be a greater force the heavier the material is, and in order to compare samples of different weights it is frequently desirable to be able to correct from one material to another on this basis. To do this, the difference between the specimen length and the drape length for the sample being measured is multiplied by the weight per unit area of the material, and this product is set equal to the difference between the length of the specimen which is known and the unknown drape length which it is desired to determine, and this difference multiplied by the weight of the sample to which it is desired to correct. Solving this equation for the corrected drape length gives the expression which has been previously stated. It is believed that it may be possible to compare the effects of finishes in an interesting manner. If a given sample is measured and its drape length and its weight per unit area determined, then it should be possible to compute what the drape length should be for a given chord length for a sample of some other weight. If now a sample of this weight be tested at the same chord length and a drape length differing from that computed is found, it is safe to infer, we believe, that the difference between the computed drape length and the measured drape length is probably

due to the finishing treatment. A series of samples are now available which have been subjected to various types of finishing operations and it is proposed to carry through a series of drape tests on these materials and to supplement them by measurements made on various types of instruments for continued comparison of methods.

Spearman's Rating System

In order to make comparisons between a series of materials which differ in stiffness, or some other measurable property, the Spearman Rating System, to which reference has been made in the first of these series of reports, will be employed. This rating takes the form of calculating the correlation coefficient for a series of ranked observations; that is, for observations which have been placed in some definite order of merit. Choosing, in this case, the rigidity, as a desirable measurable quality, the ten fabrics have been placed in order of decreasing stiffness (increasing flexibility) as the rigidity would indicate. The bending length, the bending modulus, and the results from various other tests have then been ranked in similar fashion. . It would not be expected (because of the inherent variability of textile materials and because of experimental and other difficulties) that there would be perfect agreement between

TABLE 1

	Fabric Weight		Fabric Thickness (Thousandths of an in.)
	mgm./cm.^{2}	oz./yd.^{2}	
Unlaundered Organdie	4.96	1.46	6.0
Laundered Organdie	5.26	1.55	6.9
Tracing Cloth	10.80	3.19	3.25
Treated Thin Cotton	10.95	3.23	8.4
Plain Thin Cotton	11.31	3.34	6.3
"Velvet"	16.04	4.73	21.1
Plain Congo	23.37	6.89	14.7
A. C. Congo	26.09	7.70	14.5
Treated Thick Cotton	42.70	12.60	31.7
Plain Thick Cotton	44.92	13.25	27.1

the various systems. This is particularly true inasmuch as different instruments measure slightly different characteristics of the fabric. However, by means of the Spearman rating (expressed in per cent) it is possible to judge the excellence of agreement between different sets of ranks. As an illustration of how the system works the reader should refer to Table 2 in which the ranks assigned to the various fabrics have been recorded and are based on the grand average of determinations with face of the fabric in, face of the fabric out, warpwise, fillingwise, etc. It will be seen immediately that the treated thick cotton fabric, which was notably hard and stiff to the touch, is rated first as to stiffness by all but one of the measuring techniques. The bending modulus is the measurement which takes into account the paperiness of the material and takes account also of the thickness of the sample. Thus, this measure places the tracing cloth first in stiffness because it is by far the most papery material of the series. It should also be noted that in four cases out of seven

the "velvet" material, which is notably the softest and also the most flexible of the series, was placed at the end of the list. The readings in the body of the table are more or less irregular, but on the whole when computed in the form of the Spearman rating they have some significant value. To obtain an idea of this result refer to Table 3 which lists the Spearman rating of each method of measurement compared to every other for the series of ten fabrics and the series of measurements noted in Table 2. The rigidity was computed directly from the bending length and it would therefore be expected that there should be a high degree of relationship between these values. Inspection of Table 3 indicates that a Spearman rating of 86% is to be found, and a rating of 88% between the bending length and the bending modulus. It would not be expected in normally variable textiles that as high a Spearman rating as this would be obtained for measurements which are to be related only by physical tests and not by mathematical computation. It is not surprising, therefore, to find values in the table ranging from 30 to 60%.

Certain of the values in Table 3 will be noted to be negative and the significance of this should be pointed out. Reference to Table 4, which gives the method of computing the Spearman rating in detail for three possible cases,

Table 2

Grand Average Ranks

	Bending Length	Flexural Rigidity	Bending Modulus	Schiefer Flexometer	Chord Length	Radius of Curvature	Gurley Tester
Treated Thick Cotton	1	1	3	1	1	1	1
Plain Thick Cotton	5	3	8	3	2	2	2
Tracing Cloth	2	2	1	2	10	10	4
Unlaundered Organdie	3	4	2	6	4	3	9
Laundered Organdie	4	5	4	9	3	6	10
Treated Thin Cotton	6	9	6	4	8	7	8
Plain Thin Cotton	7	8	5	7	9	9	7
A. C. Congo	8	6	7	5	7	5	3
Plain Congo	9	7	9	8	6	4	5
"Velvet"	10	10	10	10	5	8	6

Table 3

Spearman Rating Per Cent

	Gurley Tester	Radius of Curvature	Chord Length	Schiefer Flexometer	Bending Modulus	Rigidity
Bending Length	12	27	29	69	88	86
Rigidity	48	48	42	71	65	—
Bending Modulus	−15	−6	−9	48	—	
Schiefer Flexometer	64	30	4	—		
Chord Length	20	83	—			
Radius of Curvature	38	—				

TABLE 4

SPEARMAN RATING

Formula: $\rho = 1 - \frac{6\Sigma d^2}{N(N^2 - 1)}$

CASE 1

A	B	d	d^2
1	1	0	0
2	2	0	0
3	3	0	0
4	4	0	0
5	5	0	0
		$\Sigma d^2 =$	0

$$\rho = 1 - \frac{0}{5(24)}$$

$$= 1 - 0 = +1$$

CASE 2

A	B	d	d^2
1	5	4	16
2	1	1	1
3	2	1	1
4	3	1	1
5	4	1	1
		$\Sigma d^2 =$	20

$$\rho = 1 - \frac{120}{5(24)}$$

$$= 1 - \frac{120}{120}$$

$$= 1 - 1 = 0$$

CASE 3

A	B	d	d^2
1	5	4	16
2	4	2	4
3	3	0	0
4	2	2	4
5	1	4	16
		$\Sigma d^2 =$	40

$$\rho = 1 - \frac{6(40)}{5(24)}$$

$$= 1 - \frac{240}{120}$$

$$= 1 - 2 = -1$$

will clear this matter up. The Spearman formula is noted at the top of Table 4 and the first case indicates the ranking of sample series "A" with sample series "B". Here it will be seen that both are ranked identically and that the difference between the values in column "A" and column "B" is zero in each case, as is the square of each of these differences. Substitution of the sum of the squares of the differences in the formula together with the number of items in each rank (N) gives us + 1 as the rating. In terms of per cent this would be 100% and would indicate perfect agreement.

Case 2 of Table 4 indicates a ranking in numerical order for series of specimens "A" and a different ranking in the case of specimen series "B". The difference between the columns "A" and "B" is indicated together with the square of the differences and the sum of the squares of the differences, and when this is substituted into the formula we arrive at a Spearman rating of zero, which indicates that there is no agreement between the two rating systems.

Case 3 of Table 4 indicates that the ranking in series "A" is opposite to the ranking in series "B", and the differences, squares of differences and the substitution of the sum of the squares of the differences into the formula gives

us a Spearman rating of -1 (or -100%). This would indicate that there is a reverse relationship between the ranking, and that while one series shows an increase of a certain property the other shows an exactly corresponding decrease of this property.

It will be noted that in the Spearman Rating Table (Table 3) the negative values are small, and it is doubtful at this time and because of the small number of samples tested that these are significant. It may be, however, that they indicate a reverse trend and this tendency will bear further investigation. It should be noted that it is the bending modulus which has this reverse rating, and that this is the item in which we are likely to find the greatest amount of interest in interpretation of results—comparing them with such things as bending length, rigidity, and force to deform.

It must be emphasized that Tables 2 and 3 simply show trends developed by the testing of a series of randomly selected fabrics, and that they are not to be taken as final comparisons between methods. The method of use of this rating system is important enough to warrant the discussion with which the latter part of this paper has been occupied and the method will be used in future papers; thus it is believed wise to give a more detailed explanation of it at this time than might otherwise seem warranted. The reader is cautioned to avoid drawing too definite conclusions from the data thus far presented. He is warranted, however, in noting the fact that the various techniques which have been employed have one thing outstandingly in common. They are measuring in each case differences in flexibility which are very difficult to determine in any ordinary way. One of the outstanding advantages (as shown from the present series of tests) in the drape test method is that it is probably the most sensitive of the entire series. Thus far it appears to be the only method of measurement which will satisfactorily and consistently distinguish between bending of the fabric with the face toward the concave side and with the face toward the convex side respectively. The differences of flexibility warpwise and fillingwise are marked enough to be indicated by any of the methods, but when slight differences of finish on the face as opposed to the back of the fabric are to be detected it seems that the drape test has decided possibilities. For this reason the drape tester is to be redesigned and rebuilt in more convenient and versatile form, and will undoubtedly be mounted as a single unit and also as a multiple set so that convenient comparisons may be rapidly made between specimens of different properties. It is felt that the test is simple enough and inexpensive enough to construct and operate so that it should appeal to persons in the textile industry for whom flexibility of fabric is an important item. It is hoped, therefore, that the simplicity and ease of operation of the test will commend itself to these individuals and that they will have opportunity to carry out further tests and accumulate a large amount of data which can then be discussed and correlated to the mutual benefit of the industry at large.

Photochemical Decomposition of the Cystine in Wool

By HENRY A. RUTHERFORD and MILTON HARRIS *

A Textile Foundation Publication

Abstract

The work reported in the present paper is a continuation of earlier work on the photochemical decomposition of wool. The data confirm the hypothesis that the primary action of the radiation, which results in a change in the state of the sulfur and a corresponding lowering of the cystine content, is independent of the moisture in the system. The results indicate, however, that moisture plays an important role in the secondary process, namely that involving the evolution of hydrogen sulfide from the irradiated fibres. It is also shown that decomposition of the cystine resulting from thermal reactions under the conditions of these experiments, is negligible.

Introduction

IN two earlier papers on the effect of light on wool [1, 2] it was shown that one of the chief points of attack is the disulfide group of the amino acid, cystine. The data suggested that the primary action of the radiation is an activation of the disulfide group, resulting in a change in state of the sulfur, and a corresponding lowering of the cystine content. A secondary process, involving the evolution of hydrogen sulfide from the irradiated wool, then occurs. The rate of the primary reaction, that is, the decomposition of the cystine, appeared to be independent of the amount of water vapor in the system surrounding the fibres during irradiation. It was believed, however, that water might play an important part in the secondary reactions. The work reported in the present paper is a continuation of the earlier investigation.

Experimental Procedure

The apparatus, with the exception of a few minor changes described below, and technique of operation were the same as described in detail in an earlier paper.[2] The wool samples were irradiated in specially constructed tubes, in atmospheres of moist and dry nitrogen. The nitrogen, which was used as a carrier gas to remove the hydrogen sulfide formed

* Research Associates at the National Bureau of Standards, representing the Textile Foundation, Inc. This is the fourth publication of the new research program of the Textile Foundation at the National Bureau of Standards.

during the irradiation, was first freed from oxygen by passing it through two towers of alkaline pyrogallol. The emerging gas was divided into two portions, one of which was moistened by passing it through distilled water, while the remainder was dried over anhydrous magnesium perchlorate and phosphorus pentoxide. From the drying and moistening towers, the gas passed through the exposure tubes and finally into an alkaline solution of bromine for absorption of hydrogen sulfide. The smooth, elliptical aluminum reflector, used around the lamp and exposure tubes in the original apparatus, was replaced by a corrugated reflector in order to insure a more nearly uniform irradiation of the fibres. A stopcock was inserted between the tubes emerging from the drying and moistening towers so that both exposure tubes could be supplied with moist or with dry nitrogen at the same time.

Single-ply wool yarn of very low twist was used for the exposures. The yarn was prepared from raw wool which had been extracted with Stoddard solvent and washed with water. It was further purified by extraction in a Soxhlet apparatus with alcohol and ether, for 6 hours each, and finally washed with water at 50° C.

(1) *Effect of Light on the Cystine in Wool.*—Twenty 100-mg. portions of the yarn were wound in adjoining layers on each of the two hexagonal glass frames. The wool on one frame was dried in an oven at 105° C. for 3 hours, then rapidly transferred to the exposure tube, where it was further dried in a stream of dry nitrogen at 90° to 100° C. for 24 hours. The exposures were then started, dry nitrogen being passed over the dried sample and moist nitrogen over the other. During the exposures, the frames were rotated as described earlier.[2] After different time intervals, two of the 100-mg. skeins, one from the top and one from the bottom of each frame, were removed from each of the exposure tubes and analyzed for cystine by the Sullivan method[3] using the hydrochloric-formic acid mixture for hydrolysis, as described by Miller and du Vigneaud.[4] The cystine contents of the samples after the exposures are shown in Table 1.

TABLE 1

The cystine content of wool after irradiation in atmospheres of moist and of dry nitrogen.

Duration of exposure hrs.	Moist Nitrogen		Dry Nitrogen	
	cystine %	sulfur %	cystine %	sulfur %
0	13.2	3.57	13.2	3.57
98	10.1	—	10.1	—
196	8.2	—	9.2	—
299	7.0	—	8.0	—
394	5.7	—	6.8	—
493	5.2	2.99	6.3	3.35

(2) *Effect of Temperature.*—The temperature in the exposure tubes as measured by a mercury thermometer (the bulb of which was covered with a thin layer of wool yarn) varied between 65° and 70° C. Since the temperature coefficient of most photochemical reactions is known to be

small compared with that of most thermal reactions, it is hardly likely that the rate of decomposition of the cystine was appreciably affected by this small variation in temperature.

In order to determine whether some of the cystine was destroyed by thermal reactions alone during the long exposures, samples of wool were heated in the dark in atmospheres of moist and dry nitrogen at 60° and 105° C. An experiment was run at the higher temperature since it was conceivable that the temperature on the surface of the fibres might be somewhat higher than that indicated by the thermomenter. The wool yarn was placed in glass tubes in an oven, and nitrogen, dried or moistened by passing through towers of phosphorus pentoxide or water, was passed over the samples at the rate of about 3 liters per hour. The nitrogen was preheated to the desired temperature after leaving the towers by allowing it to pass through about 12 feet of copper coil in the oven. After different time intervals, duplicate samples were removed for sulfur and cystine analyses, the results of which are shown in Table 2.

TABLE 2

Effect on the sulfur and cystine in wool of prolonged heating in the dark.

Temperature °C	Duration of heating hrs.	Total sulfur		Cystine	
		moist %	dry %	moist %	dry %
—	0*	3.55	3.55	12.7	12.7
60	210	3.57	3.60	13.3	13.3
60	500	3.53	3.56	13.4	13.4
105	192	3.55	3.56	12.5	12.4
105	408	3.55	3.52	11.7	12.3
105	600	3.50	3.55	12.2	11.7

* Untreated wool.

(3) *Nature of the Primary and Secondary Reactions.*—Samples of the wool yarn were wound on the glass frames and irradiated in atmospheres of moist and dry nitrogen for 200 hours. The lamp was then turned off, the temperature maintained at 70° C., and moist nitrogen passed over both samples for about 300 hours. Finally, the lamp was again turned on and both samples were irradiated in atmospheres of moist nitrogen for an additional 300 hours. The rates at which sulfur, in the form of hydrogen sulfide, is evolved from the wool are shown in Fig. 1.

Discussion

The data recorded in Table 1, showing the relative rates of decomposition of cystine during irradiation in atmospheres of moist and of dry nitrogen, confirm the earlier observation that the primary action of the radiation, which results in the decomposition of the cystine, is independent of the moisture in the system. The cystine contents of the samples irradiated in atmospheres of moist nitrogen are slightly lower but in view of experimental difficulties, such as keeping the intensity of the light on both

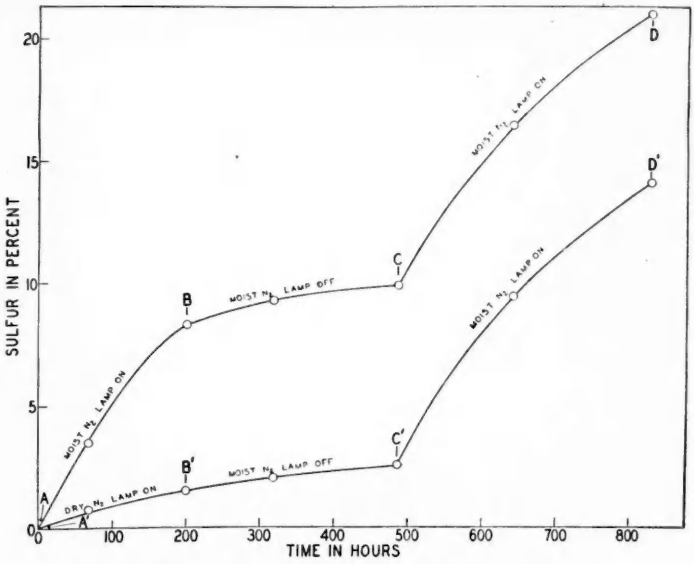

FIG. 1. The rate of evolution of hydrogen sulfide from wool (1) during irradiation in atmospheres of moist and dry nitrogen, (2) in the dark in atmospheres of moist nitrogen, the temperature being maintained at 70° C, and (3) during irradiation in atmospheres of only moist nitrogen.

The ordinate values are in terms of the percentage of the total sulfur which was evolved as hydrogen sulfide during the treatment.

samples equal * and constant, these small differences cannot be considered as significant at this time. Furthermore, the differences are extremly small when compared with the difference between the rates of evolution of hydrogen sulfide from wool irradiated in atmospheres of moist and of dry nitrogen.

The decomposition of the cystine under the conditions of these experiments appears to result from potochemical rather than thermal reactions. As was pointed out previously, the temperature in the exposure tube varied between 65 and 70° C. However, the estimation of the exact temperature on the surface of the fibre would be very difficult and for that reason, an experiment in the absence of light was also run at 105° C. The data, given in Table 2, show that no significant changes in sulfur or cystine contents of the wool occurred during the prolonged heating at 60° and 105° C.

Although the presence of moisture in the atmosphere surrounding the fibres during irradiation is not required for the primary reaction involving

* When samples were irradiated under the same conditions in both exposure tubes, hydrogen sulfide was evolved at the same rate. This was the basis for assuming equal intensity during subsequent experiments.

the decomposition of the cystine, the present work indicates that it does play an important role in the secondary process involving the evolution of the hydrogen sulfide from the irradiated fibres. Furthermore, it should be emphasized that the primary reaction is much more rapid than the secondary reaction, and that the rate of evolution of hydrogen sulfide from the wool is determined by the rate of the secondary process. In addition it appears that the secondary process is essentially a photochemical one as indicated by the BCD and B'C'D' portions of the curves in Fig. 1. That a small amount of hydrogen sulfide is probably split from irradiated wool by thermal processes is indicated by the slopes of BC and B'C', but a comparison with those of the CD and C'D' portions shows that the amount is extremely small.

The authors can, at present, offer no complete explanation of the photochemical processes involved in the decomposition of the cystine in wool. The results to date suggest that the initial stage of the photochemical decomposition is an absorption of the radiant energy resulting in the dissociation of the R–S–S–R group, probably into $R–S^+$ and $R–S^-$ ions. This reaction does not appear to be catalyzed by moisture. A cleavage of this type for the photochemical decomposition of cystine itself has been postulated by Anslow and Foster,[5] who showed that when radiant energy is absorbed by this substance, the linkage between the halves of the molecule is weakened, which results in the disruption of the molecule. A possible secondary reaction would then be the reaction of the products of the primary process with water to form RSH and RSOH compounds. The latter are unstable and generally decompose with the liberation of hydrogen sulfide.

References

1. A. L. Smith and M. Harris *N. B. S. J. Rsch., 17,* 97 (1936) RP 904.
2. M. Harris and A. L. Smith. *N. B. S. J. Rsch., 20,* 563 (1938) RP 1091.
3. M. X. Sullivan. Public Health Reports, *86* (1930).
4. G. Miller and V. du Vigneaud. *J. Biol. Chem., 118,* 101 (1937).
5. G. A. Anslow and M. L. Foster. *J. Biol. Chem., 97,* 37 (1932).

(*Continued from page 4*)

Temperature Measurement and Control

THE American Institute of Physics will present a "Symposium on Temperature, Its Measurement and Control in Science and Industry" at the Hotel Pennsylvania, New York City, Nov. 2, 3 and 4. It is open to all interested persons, and an advance program with abstracts of papers can be had by addressing Temperature Symposium Committee, 175 Fifth Ave., New York, N. Y.

Guanaco Fibres

By DR. A. C. WHITFORD *

THE data contained in this article was obtained while investigating archaeological material for the American Museum of Natural History of New York and while carrying on an extensive microscopical research upon animal fibres for S. Stroock & Co., of New York who use Guanaco and Guanoquito (Baby Guanaco) fibres in the manufacture of their exclusive cloths.

The samples examined are as follows: Guanaco and Guanoquito fibres obtained from the American Museum of Natural History. This is archaeological material collected by Mr. Junius Bird from caves at Cerro Sota Hill in extreme south South America. The material was found buried under from three to ten feet of accumulated dust, rock and volcanic ash. Its estimated age is something like 10,000 years and was deposited soon after the end of the Pleistocene Age. The Guanaco material had been used to wrap human bodies for burial or to line the burial pits. Mr. Bird in his report on the finds says concerning these burials that they are "The first human remains accompanied by artifacts in clear association with extinct fauna found in the New World." The extinct animals referred to are the native horse and the giant ground sloth. In a personal letter he states, "The bodies (human) had been cremated in a shallow pit but a portion of one skull was unburned and retained a little hair. In contact with this was several layers of what appears to be young Guanaco. These were daubed with red pigment and may have been wrapped around the bodies." This material is the Guanoquito to be discussed later. In his report on the archaeological discoveries in that region he also states, "The fireplaces in it contained broken and burned native horses, sloth and guanaco bones with associated artifacts." It was from these fireplaces that the Guanaco hairs were obtained.

The modern samples examined include Guanaco hairs from Navarino Island (their southernmost habitat), Patagonia and Bolivia. The Guanoquito samples examined are from animals inhabiting Southern Argentine (a baby about three weeks old), Magellan, Bolivia and Mexico. This list of samples affords a good range for comparison of hairs both as regards changes due to time and geographical distribution.

The table gives the measurements of the fibres and wherever averages are given it represents a minimum of 50 hairs and in most cases 100–150. In making this tabulation an arbitrary division was taken, based upon fibres taken from cloths manufactured by S. Stroock & Company, to separate "Coarse Hairs" from "Noils." This figure is 33.2 microns. All hairs measuring more than this are called "Coarse Hairs" and all under this figure are called "Noils." The number of scales per inch represents the number in a row lengthwise of the hair and does not take into consideration the fact that there are in some cases more than one row represented in the circumference of the fibre.

* Research Chemist, Alfred, N. Y.

An examination of the table shows no startling variations and the only difference which seems to be constant is that the number of scales per inch is somewhat less in the archaeological material both for the noils and the coarse hairs in both Guanaco and Guanoquito. The average diameter of the noils is less in the Cerro Sota sample of Guanoquito while the smallest noils in the Guanaco are found to be those of the modern animal inhabiting Bolivia. It might not be out of place to remark that these Bolivian fibres are from samples furnished by S. Stroock & Co. and were taken from their storage material used in the manufacture of cloth.

Guanaco Hair Measurements

Description of Animal	Fine Hairs or Noils					Coarse Hairs, Over 33.2 Microns		
	Max. Dia.	Min. Dia.	Avg. Dia.	Scale Length	Scales per in.	Avg. Dia.	Scale Length	Scales per in.
Cerro Sota Cave, early post Glacial Period	33.2	14.9	23.7	10.8	2354	49.8	11.3	2266
From Navarino Island, southernmost habitat	33.2	16.6	25.9	10.6	2396	66.4	9.6	2646
Patagonian Guanaco	33.2	11.6	24.2	8.3	3060	73.2	7.1	3577
Bolivian Guanaco	33.2	11.6	17.6	8.6	2990	49.8	8.3	3036
Guanoquito (Baby Guanaco) Cerro Sota Cave	18.3	10.6	12.4	12.4	2049	None	—	—
Southern Argentine	24.9	11.6	16.4	10.6	2396	38.2	6.8	3735
Magellan	33.2	13.2	21.4	10.8	2352	44.8	8.9	2854
Bolivian	33.2	9.9	18.6	10.2	2490	None	—	—
Santa Cruz, Mexico	33.2	13.2	20.1	9.9	2554	58.1	8.3	3060

In the samples briefly described above there seems to be no decided distinction between the archaeological and recent specimens or between the samples from the various geographical localities. The most pronounced distinction found is the more pronounced serrations on the scales of the archaeological material from Cerro Sota. While this may be due to the length of time they have been buried and to some chemical action which has taken place, it seems more likely to be due to a specific distinction. This is indicated more strongly as all the hairs examined from Cerro Sota showed a very pronounced serration and one which could not be mistaken but as being more pronounced than the serrations on the modern specimens. There were also fewer scales per inch on the ancient fibres except in the case pointed out previously. It might be well to point out that the southernmost samples as a rule showed fewer scales per inch than those from further north.

It is only fit and proper at this time to give due credit and express my appreciation to the American Museum of Natural History of New York for their co-operation and assistance in getting together parts of the material, and to S. Stroock & Co. for their very material assistance and supply of samples ranging from the crude fleece to woven Guanaco and Guanoquito cloth.

Abstracts

Committee on Abstracts and Bibliography:
E. R. Schwarz, Chm., Dr. E. J. Saxl, C. H. Clark.

Members of U. S. Institute for Textile Research desiring complete copies of articles abstracted may avail themselves of any or all of the following services by addressing the Secretary:

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Address, C. H. Clark, Sec., 65 Franklin St., Boston, Mass.

I. Fibres (Synthetic and Natural) and Fibre Analysis

Cotton Fibre: Inter-relationships of Measurable Characters. R. L. N. Iyengar. *Indian J. Agric. Sci.*, 1939, V. 9, P. 305–29; abs. in *J. T. I.*, Aug. 1938, P. A543.

In extension of work by the author and Turner (1930) on the relationships between length and weight in cotton, relationships between length and other characters are now discussed, the material examined being Indian cotton. The following conclusions are drawn: (1) the variation of the maturity of fibres with respect to length is different in different strains; (2) the convolutions per unit length indicate different trends of variation; (3) the maximum ribbon-width, mean ribbon-width and swollen diameter generally decrease with increase in length; (4) the minimum ribbon-width and swollen wall-thickness are not reliable measures; (5) the number of convolutions per unit length decreases with decrease in degree of maturity; (6) fibres are more uniform in their physical properties in the longer lengths than in the shorter; (7) the effect of irrigation in strain Co_2 is to increase the diameter of the fibre-cell, more especially in the longer lengths; and (8) the mean weights of the thin-walled and dead fibres are slightly greater than the values obtained by Peirce and Lord (1934). (C)

Cotton Hair: Structure. K. Hess. *Papier Fabrik.*, 1939, V. 37, *Techn.*, P. 25–8; abs. in *J. T. I.*, May 1939, P. A338.

A plea is put forward for consideration of the morphological evidence on the structure of the cotton hair in discussions of the molecular chain

length and micellar dimensions of cellulose, based on viscosity and end-group determinations. The work of Balls and Kerr on daily growth rings in cotton is discussed. (C)

COTTON HAIR: STRUCTURE. W. Wergin. *Naturwiss.*, 1938, V. 26, P. 613 (through *Chem. Zentr.*, 1939, i. P. 977); abs. in *J. T. I.*, Aug. 1939, P. A540.

Longitudinal sections of ripe cotton hairs, 5 μ thick, were treated with cuprammonium and caustic soda. Besides the cellular defibrillation of the lamellae, it was possible to discern a partition of the single fibrils into fragments with dimensions about 0.2 μ. It is suggested that the appearance is due to the swelling of a more reactive substance occurring at regular intervals between the fragments. (C)

COTTON HAIR: UNCOLLAPSED AND MERCERIZED DIAMETERS. J. H. Moore. *J. Amer. Soc. Agron.*, 1938, V. 30, P. 604–9 (through *Exp. Sta. Rec.*, 1939, V. 80, P. 431).

Diameters of uncollapsed and mercerized hairs from seven strains of American Upland cotton were measured. The methods are described in the original. The correlation coefficient of the two diameters was 0.95 and the ratio of mercerized to uncollapsed diameter ranged from 0.623 to 0.665, average 0.643. (C)

ELECTROPHORETIC STUDIES OF SILK. Arnold M. Sookne and Milton Harris. *Text. Rsch.*, 1939, V. 9, P. 374–82; *N. B. S. J. Rsch.*, Aug. 1939, P. 299–308, RP 1234; *Am. Dye. Rptr.*, Aug. 7, 1939, P. 412–6.

A micro-electrophoretic technique was used to determine the characteristic pH-mobility curves for fibroin and for sericin and to ascertain the extent of removal of the latter during degumming by the soap and enzyme processes. The data suggest that sericin contains a much greater proportion of reactive groups than fibroin, and indicate the importance of obtaining either uniform or complete removal of sericin during degumming processes. The isoelectric points are shown to vary slightly with ionic strength. In acetate buffers of 0.02 *M* ionic strength, the isoelectric point of fibroin is 3.6 and that of sericin 4.3. Large ions of complex structure such as phthalate or picrate appear to have specific effects which are readily detectable by the electrophoretic technique. Dissolved fibroin adsorbed on glass particles and fibroin regenerated from similar solutions had the same isoelectric points but different pH-mobility curves. Fibroin regenerated after dissolving in solutions of lithium bromide gave the same pH-mobility curve as untreated fibroin. (C)

INSECTS ATTACKING WOOL. Justin-Mueller. *Teintex*, 1939, V. 4, P. 164–70, 226–9; abs. in *J. T. I.*, July 1939, P. A468.

An illustrated description is given of the life cycle and habits of the webbing clothes moth (*Tineola biselliella* Hum.) and of larder beetles (*Dermestres*, *Anthrenus* and *Attagenus* families.) Figures are quoted showing the extent of the ravages of the clothes moth and details given of the protection afforded by Eulan N. (C)

II. Yarns and Fabrics

Anti-Shrink Business. A. Tsimehe. *Silk J. & Rayon Wld.*, Mar. 1939, P. 31; April, P. 34–5.

The first article is on methods of counteracting the shrinkage of textile materials with chief attention to modern work on the subject, and deals with wool. While the older hypochlorous acid treatment is touched upon, all the recent patents on chlorination processes will be reviewed, including the American alkyl hypochlorite patents only recently released. Later articles will deal with the chemical and mechanical means adopted to produce anti-shrink cellulosic fabrics. The second discusses the Woolindraw Process, the U. S. War Dept. Process, and the Dri-Sol Process. (C)

Bleaching Linen: New Process of. E. Butterworth, B. P. Ridge, Fraser and Haughton, Ltd., and I. C. I., Ltd. *Text. Mfr.*, Jan. 1939, P. 35.

A two-stage process of bleaching flax, hemp and jute with hypochlorite and peroxide under controlled but convenient conditions. Cellulose degradation is avoided independently of the shade required, and the shade and loss of weight can be adjusted as desired. "The new methods are the patent (B.P. 489,496) of E. Butterworth, B. P. Ridge, Fraser and Haughton, Ltd., and I.C.I., Ltd., and by them any degree of whiteness can be produced on flax yarn or linen by a quicker and convenient process, keeping the alkali 'solubility number' (Nodder, J. T. I., 1931, P. T416, the 'solubility number' is a measure of degradation of the cellulose) less than five and even less than four." (C)

Capacitance of Textile Materials in Relation to Moisture Content. Barbara Bailey and Ethel L. Phelps. *Text. Mfr.*, July 1939, P. 289, 301; *Text. Rsch.*, Jan. 1939, P. 101–13. (C)

Carder, Know Your Cotton. E. H. Helliwell. *Text. Wld.*, Mar. 1939, P. 75, 77.

The author rightly claims that maximum length of fibres at point of processing is more important than classified length. (C)

Carding Crossbreds on the Botany Card. *Wool Record & Text. Wld.*, July 13, 1939, P. 87–90.

Methods are described by which most Botany cards may by careful alteration and adjustment be suitably converted to deal satisfactorily with crossbred wools as low as 48s and 50s quality, provided they are of carding length and not definitely preparing wools. (C)

Casein Fibre. G. Heim. *Text. Mfr.*, June 1939, P. 248.

Abstract of a paper at recent annual conference of The Textile Institute at Bath, Eng. (C)

"Casein Fibre": Manufacture and Properties. C. Diamond and R. L. Wormell. *Text. Mfr.*, June 1939, P. 247.

Abstract of a paper at recent annual conference of The Textile Institute at Bath, Eng. (C)

CELLULOSE FIBRES IN TECHNICAL FELTS. J. Bartsch. *Faserforschung*, Mar. 16, 1938, P. 99–108; abs. in *Paper Trade J.*, Jan. 19, 1939, P. 30.

The author gives a general review of technical felts, their most common applications, and requirements for various purposes. Artificial fibres cannot be fulled at the present time, and it would be quite impossible to manufacture a fulled felt from staple fibre. Nevertheless, additions of 20–25% staple fibre do not impair the fulling operation; the dry strength is not affected, but is rather increased; wet strength and elongation, however, decrease decidedly in ratio to higher additions. As long as technical felts are only used under dry conditions, a certain percentage of staple fibre is quite permissible, the amount depending upon individual conditions. If, however, elasticity of the felt surface is of prime importance, or when the felts are used in moist condition, eventually at elevated temperatures and in the presence of chemicals, even small additions of staple fibres developed to date, the author states, are not suitable. (C)

CLINGING POWER OF FIBRES ON YARN-STRENGTH IRREGULARITY: EFFECT OF. K. R. Sen and Nazir Ahmad. *Indian Text. J.*, March 1939, P. 239–40.

It is found that a distinct tendency exists for fibres possessing high clinging power to yield yarns which register high yarn-strength irregularity. This feature holds both for cotton fibres and staple (viscose) fibres spun either in the pure state or in a mixture. No direct proportionality between the two is observed owing to the following disturbing factors: (1) fibre to fibre variation in clinging power, (2) large sampling error in single thread test and (3) lack of perfect homogeneity in the mixture. (C)

"CONTROL" IN A TEXTILE FINISHING WORKS. C. L. Wall. *Text. Mfr.*, 1939, Feb., P. 73–4, 77; Mar., P. 120–21; April, P. 169–70.

Requirements of organization in a large printing and finishing works referring to an actual reorganization. (C)

COTTON: NEW USES FOR. A Proposed Research Program. A. R. Macormac. *Am. Dye. Rptr.*, Feb. 6, 1939, P. 54–8. (C)

COTTON QUALITY: POSSIBILITIES AND LIMITATIONS OF THE SPINNING TEST AS A MEANS OF DETERMINING. Malcolm E. Campbell. *Indian Text. J.*, May 1939, P. 317–8; reprinted from *Text. Rsch.*, June 1938, P. 263–9. (C)

COTTON SEWING THREADS: MANUFACTURE OF. Henry Miedendorp, Jr. *Rayon Tex. Mo.*, Jan. 1939, P. 67–8. (C)

(COTTON) YARN: EFFECT OF EMPLOYING DIFFERENT SPEEDS IN THE DRAW FRAME ON THE QUALITY OF. V. V. Gupte and Nazir Ahmad. *Technological Bulletin, Series A, No. 47*, of Indian Central Cotton Committee Technological Laboratory, Bombay.

Six Indian cottons, ranging in length from 0.7 in. to 1 in., were passed through the same draw frame twice at front roll ($1\frac{3}{16}$ in. dia.) speeds approximating 320, 370, 425 and 475 r.p.m. The slivers were then passed through slubber, intermediate and roving frames with normal settings and speeds, and were spun into suitable counts from single roving on an ordi-

nary three-roll ring frame. Ends-down on the ring frame tended to increase on rovings produced at draw frame speeds from 320 to 425 r.p.m., and then to decrease up to 475 r.p.m. It is suggested that the drafting conditions associated with the higher draw frame speeds cause modifications in the orientation of the fibres in the sliver and aid ring spinning behavior. The effect of still higher draw frame speeds awaits investigation. Within the limits of the draw frame speeds used the lea strength of the spun yarns showed little appreciable variation, especially of yarns spun from the longer cottons. Based upon quality (yarn strength x elongation/deviation in strength) however, it was found that best results were given by slivers processed at the lowest draw frame speeds, and the poorest by those processed at the two highest speeds. The draw frame front roll speeds and the lengths of the longest cottons were approximately the same as those in the Peacock experiments (*Tex. Rsch.*, May 1938, P. 245) and the results tend to controvert the latter's conclusion that as draw frame front roll speeds increase the tensile strength of the yarn spun therefrom increases. (C)

COTTON SPINNING MACHINES: PRODUCTION AND EFFICIENCY DETERMINATIONS. G. Schmalfuss. *Klepzig's Textil-Z.*, 1939, V. 42, P. 199–201; abs. in *J. T. I.*, June 1939, P. A379.

Methods of determining productions and efficiencies are explained and illustrated by examples of applications to ring and mule spinning machines. Examination of the number and causes of machine stoppages is recommended and causes of differences between practical and theoretical productions are briefly discussed. (C)

DENIERS AND FILAMENT NUMBERS: CHANGES IN AMERICAN. H. R. Mauersberger. *Rayon Tex. Mo.*, April 1939, P. 62.

A tabulated list is revised as of April, 1939. (C)

FAULTS IN WOOLEN CARDING AND SPINNING. G. Marshall. *Text. Mfr.*, 1939, May, P. 197–8; June, P. 241–2.

Discusses usual faults that may arise in woolen yarn manufacture and steps to avoid those due to carding and spinning. (C)

FELT: DRYING. J. Cabanel. *Fils et Tissus*, 1939, V. 27, P. 169–75; abs. in *J. T. I.*, June 1939, P. A393.

Results obtained in a study of the drying of felt are discussed and it is shown that, in order to obtain the best results, the hot air used for drying should be descending, not ascending as in many drying systems, in the drying chamber. The amount of water to be evaporated is calculated for a particular case and estimates are made of the amount of heat to be supplied and the required temperature of the heated air for air supplies of different temperatures and humidities and a given rate of passage of the heated air through the drying chamber. (C)

FIBRE CONTROL DURING SPINNING. Donald Wilson. *Wool Record & Text. Wld.*, Mar. 2, 1939, P. 491–95.

An analysis of factors responsible for fibre control in the English system of drafting worsted rovings, and comparison with the Continental system and the trend in the latter to high drafting. (C)

FINISH OF STAPLE FIBRE FABRICS: AIM AND THE PRESENT POSITION OF THE HIGH-QUALITY. G. Ziersch. *Mell. Textilber.*, 1939, No. 7, P. 513–16.

The article discusses these problems in detail. (C)

FINISHING OF SPUN RAYON FABRICS. Eric Croen. *Cotton*, June 1939, P. 58–60, 81. (C)

FINISHING YARN-DYED FABRICS. C. Norris Rabold. *Text. Wld.*, 1939, Feb., P. 42–3; Mar., P. 80–1; April, P. 76–7.

The first article deals with the bleaching of colored-yarn shirtings. In the second article the author discusses the dyeing, starching, and preshrinking of shirtings having colored-yarn effects; the third article explains the many precautions that are necessary in processing underwear fabrics and tickings. (C)

FLAX AND HEMP: COTTONIZING. W. Schulz. *Leipz. Monats. Text. Ind.*, 1939, V. 54, P. 15–22, 49–57; abs. in *J. T. I.*, June 1939, P. A371.

Processes for the preparation of spinnable fibre from flax and hemp, including cottonizing processes, are reviewed and a new German patent cottonizing process is described which is characterized by the preliminary treatment of the bast fibre, in the form of a card sliver, with 10–15% caustic soda solution. This treatment produces a swelling of the incrusting materials, a partial conversion of cellulose to cellulose hydrate, and a curling of the fibres. By a subsequent short boiling in dilute alkali it is possible to remove practically all alkali-soluble constituents and to break up the fibre bundles into the elementary fibres. The mercerizing treatment also produces an increase in extensibility. (C)

FLAX: PROCESSING UNRETTED. S. A. G. Caldwell. *Text. Mfr.*, 1939, V. 65, P. 162, 168.

A review of the developments in extracting flax without retting and the processing of the natural flax. The physical and chemical differences between retted and unretted flax are briefly explained and the following methods of fibre extraction are outlined: Watson-Waddell process; the Dromara process; the Van Steenkiste turbine scutcher. (C)

FLAX WET SPINNING: SOME RECENT DEVELOPMENTS IN. *Text. Mfr.*, June 1939, P. 256. (C)

GILDING (STAINING) OF WOOLENS. *Wool Record & Text. Wld.*, July 6, 1939, P. 28–9.

By English manufacturers the staining of woolen yarns by wool lubricants—generally with saponification oleins—is commonly termed "gilding." In this article the various causes are discussed and methods of removing the "gilding." (C)

GLASS FIBRE: TENSILE PROPERTIES. F. O. Anderegg. *Ind. Eng. Chem.*, 1939, V. 31, P. 290–8.

HUMIDIFY THE CLOTH ROOM. *Cotton*, June 1939, P. 61–4. (C)

INTENSIFIED SCOURING AN ADDED PROTECTION IN FINISHING OF WOOL FABRICS. Klistra. *Text. Age*, Jan. 1939, P. 36–8. (C)

ISOELECTRIC WASHING OF WOOL: PRINCIPLES OF. Hans G. Meyer. *Mell. Textilber.* (German Edition), 1939, No. 5, P. 355.

The former method of scouring raw wool by means of soap or some other detergent and soda in an alkaline liquor can nowadays no longer be recommended, because the results of practical and scientific tests have shown that alkali causes changes in the wool that lead fundamentally to an increase in the sensitivity of the fibre substance, so that each further following influence to which it is exposed meets a structure that is less resistant than that created by nature. The result is that any injury to the wool fibre must become progressively more serious and even the smallest defect must show extension. Alkali should not be allowed to come into contact with wool at all during scouring; the idea that wool is protected by a casing of grease against the effect of the scouring liquor during the first stage of that process will not stand detailed examination. The ideal method of treating raw wool is to scour it in a weakly acid liquor in the neighbourhood of its isoelectric point, and recognition of that fact led to the attempt to carry it out in practice. As the result of these efforts, we are now familiar with two methods of carrying out the isoelectric scouring of wool, one being the Isolan process and the other the Leonil process. The complete elimination of alkali during the scouring process is a common feature of both methods, while the scouring process is carried out under isoelectric conditions, that is to say, the scouring liquor has a slightly acid reaction. Wool scoured in this way is open, shows no felting, the natural curl is preserved, as is also its staple, it is soft and clear, the white content is high, and the material is unusually easy to dry. Owing to the preservation of the nature of the fibre, wool scoured in this way must lead to improvement of the character of the goods in a new way and must make the finished products better able to resist wear. (C)

KNITTING OF BERETS. J. B. Lancashire. *Text. Mfr.*, July 1939, P. 305–6.

A machine knitting method of making the Basque beret. (C)

LABELING OF CONSUMER TEXTILE GOODS. Charles I. Simon. *Am. Dye. Rptr.*, July 10, 1939, P. 361–9.

Paper presented at meeting, New York Section, A. A. T. C. C., Jan. 27, 1939. (C)

LAP METER X-RAYS THE PICKER ROOM. H. Grady Lyon. *Cotton*, July, 1939, P. 52–3.

The author states that the advantage of such a diagnosis is that we have something in black and white to tell us that the machine is producing good or poor work. It also provides overseers with permanent records of the picker room. The lap meter is an accurate and time-saving device that indicates real troubles in the picker room. It can trace uneven yarn where we may least suspect it. (C)

LINEN-LIKE MIXTURE FABRICS. A. Jaumann. *Kunstseide*, 1939, V. 21, P. 96–103; abs. in *J. T. I.*, June 1939, P. A388. (C)

LUSTRE ON COATING FABRICS. G. L. Atkinson. *Canadian Text. J.*, Aug. 4, 1939, P. 31–2.

Obtaining the maximum lustre and strength of wool coating materials by correct soaping, milling, boiling, and dyeing and finishing. (C)

MACHINE ADJUSTMENTS FOR RAYON KNITTING. J. B. Lancashire. *Silk & Rayon*, Jan. 1939, P. 38, 46.

With particular reference to latch-needle, spring-needle and sinker-wheel types of machines. (C).

NYLON. I. A NEW GROUP OF HIGH MOLECULAR PROTEIN-LIKE COMPOUNDS FOR THE MANUFACTURE OF FIBRES AND PLASTICS. II. PHYSICAL PROPERTIES. E. Clayton. *Am. Dye. Rptr.*, April 17, 1939, P. 196–8.

The first part of this discussion consists of a reprint from *J. Soc. Dyers Col.*, Jan. 1939. The second part consists of data supplied by the nylon division of the du Pont Co. (C)

III. CHEMICAL AND OTHER PROCESSING (NOT OTHERWISE CLASSIFIED)

CHEMICAL DYEING PROCESSES: SOME NEW. J. Wakelin. *Am. Dye. Rptr.*, July 24, 1939, P. 400–1.

Discusses a few recent discoveries and new processes that involve some chemical change in the coloring principle at the time of its attachment to the fibre, and aim at facilitating the act of dyeing or improving the results obtained. (C)

CREASE RESISTANCE: SEARCH FOR. C. H. S. Tupholme. *Text. Col.*, Jan. 1939, P. 22–3, 60.

Reviews development with particular reference to the new synthetic resins. (C)

DYEING APPARATUS: IMPROVEMENTS. *Mell. Textilber.*, 1939, V. 20, P. 223–4.

Progress in the dyeing of yarns in bobbin form is discussed, and improvements in equipment including a suction and drying system and devices for reversing the direction of flow of the dye liquor, are briefly described, and shown in photographs and diagrams. (C)

DYEING CARBONIZED PIECE GOODS. *Wool Record & Text. Wld.*, July 13, 1939, P. 80–1.

The most recent, quickest and cheapest way of dealing with carbonized piece goods is to cut out neutralizing and scouring altogether, and to scour in the dyebath itself. When this is not possible, as in the case of goods to be milled, then careful precautions must be taken during neutralization and subsequent washing of the neutralized goods to ensure that neither residual acid nor irregular alkali distribution occurs in the neutralized pieces. (C)

DYEING CELLULOSE FIBRES WITH WOOL COLORS. J. Wakelin. *Canadian Text. J.*, Aug. 4, 1939, P. 33–4, 46.

New chemicals and methods to give cotton and rayon materials an affinity for acid wool dyestuffs. (C)

DYEING (AND DRYING) OF WOOLEN AND COTTON YARNS IN CHEESES: MODERN MACHINERY FOR. H. Jowett. *J. Soc. Dyers Col.*, May 1939, P. 251–8.

Discusses the possibilities of cheese dyeing, and describes some of the modern machinery made by H. Krantz, Aachen, Germany, who has done

much pioneering work in the design and perfecting of cheese dyeing and drying machinery. (C)

DYEING: MODERN METHODS OF. Edward W. Pierce. II. Textile Fibres and Mechanical Equipment. *Cotton*, Jan. 1939, P. 48–52. III. The Basic Dyestuffs. *Ibid.*, Feb. 1939, P. 92–3. IV. Direct Dyestuffs. *Ibid.*, Mar. 1939, P. 65–7. V. Acid Dyes and Their Applications. *Ibid.*, April 1939, P. 101–3, 113. VI. Acid Dyes Containing Metals. *Ibid.*, May 1939, P. 83–5. (C)

DYEING PROPERTIES OF ANIMALIZED FIBRES AND CASEIN WOOL. J. G. Grundy. *J. Soc. Dyers Col.*, July 1939, P. 345–50. (C)

DYEING PROPERTIES OF NEW FIBRES. H. M. Bunbury. *Text. Mfr.*, June 1939, P. 272–3.

Abstract of a paper at recent annual conference of The Textile Institute at Bath, Eng. (C)

DYESTUFFS INDUSTRY: POST-WAR DEVELOPMENTS. J. Baddiley. *J. Soc. Dyers Col.*, May 1939, P. 236–46.

Address of recipient of the Perkin Medal, presented by the Society of Dyers and Colourists (Great Britain). Mr. Baddiley is research director of Dyestuffs Group, Imperial Chemical Industries, Ltd. (C)

FABRIC DYEING APPARATUS. W. Fehrmann. *Mell. Textilber.*, 1939, V. 20, P. 218.

Fabric dyeing apparatus is described in which the fabric is wound on a perforated cylinder which is enclosed in a dyeing cylinder, the latter being connected with two storage cylinders for the dyeing liquor. By means of compressed air the liquor is driven from one cylinder into the dyeing cylinder, through the fabric, and finally to the other storage cylinder. Rinsing, steaming and various after-treatments can be carried out in the same apparatus and a preliminary drying can be effected with compressed air. (C)

FINISHING OF MODERN ALL-SPUN RAYON FABRICS. B. S. Hillman. *Rayon Tex. Mo.*, 1939, Mar., P. 76; April, P. 71–3. (C)

FUGITIVE TINTS: SCIENTIFIC USE AND APPLICATION OF. H. M. Block. *Rayon Tex. Mo.*, 1939, April, P. 68–9; May, P. 60–1. (C)

FULL-FASHIONED DEVELOPMENTS. Max C. Miller. *Text. Wld.*, April 1939, P. 82–3, 85.

The author discusses important new machinery developments and analyzes their effect on the industry. (C)

GAS FADING OF DYES ON ACETATE RAYON. Wm. H. Cady. *Am. Dye. Rptr.*, June 26, 1939, P. 333–5.

Paper presented before the R. I. Section, A. A. T. C. C., April 28, 1939. (C)

HYDROGEN ION DETERMINATION OF RESIDUES ON THE FIBRE. Karl Neumayer. *Mell. Textilber.*, 1939, No. 6, P. 444–5.

This permits of keeping a check on the rinsing process after finishing or washing textiles by measuring the residual acid or alkali after having extracted it at ordinary temperature. Any deleterious action on the fibre which might occur at a raised temperature is prevented by carrying out extraction at ordinary temperature, so that there is no risk that decomposition or break-down products caused by the action of the acid or alkali on the fibre might modify the results. The method can be used equally well for any type of fibre and gives results that can easily be exactly reproduced and are absolutely comparable, because they are based on the gramme of material examined extracted with ten times the volume of the weight of the sample. (C)

HYDROGEN PEROXIDE BLEACH SOLUTIONS: STABILITY OF. B. A. Harold. *Am. Dye. Rptr.*, Jan. 9, 1939, P. 1–5.

The author's conclusions are summarized as follows: A hydrogen peroxide bleach bath which is utilized for the bleaching of cotton, when prepared with the usual alkalies does not have as good a stability as one containing sodium silicate alone or in combination. Although sodium carbonate if substituted for sodium hydroxide might produce a softer and less harsh cotton, it possesses the drawback of drastically decomposing a H_2O_2 solution. For economical and well controlled bleaching, it is evident that a properly silicate buffered peroxide solution, with caustic soda as the alkali, will yield a smooth and consequent efficient decomposition. In the case of wool, where a minimum of fibre degradation is sought, a uniform decomposition may be attained by use of (1) proper temperature, (2) properly buffering the peroxide solution with either silicate or pyrophosphate of soda, and (3) adjustment of pH with ammonia along the lines discussed in the foregoing. (C)

HYDROGEN PEROXIDE: CAUSES OF LOSS IN BLEACHING. L. Bonnet. *Teintex*, 1939, V. 4, P. 22–6; abs. in *J. T. I.*, June 1939, P. A393. (C)

LANITAL: MANUFACTURE AND DYEING OF. Jean Malard. *Fils et Tissus*, 1938, V. 26, P. 753–7; 1939, V. 27, P. 25–9; *Text. Col.*, Mar. 1939, P. 195–8; April, P. 270–2; reprinted from *Dyer and Textile Printer.*

Paper read before the Spinning and Weaving Committee of the Société Industrielle du Nord de la France, and printed in "Le Monde Industriel." (C)

LINSEED OIL SIZES: DECOMPOSITION. H. J. Henk. *Kunstseide*, 1939, V. 21, P. 148–50; abs. in *J. T. I.*, June 1939, P. A386.

The decomposition of linseed oil sizes by auto-oxidation is discussed and it is pointed out that cellulose is oxidized to oxycellulose by the unstable peroxide compounds formed during the decomposition, and that fibres may also be attacked by free acids, especially formic acid, formed by the decomposition of the oil. Losses in strength may also result from the formation of incrustations of calcium and magnesium salts of unsaturated acids on drying linseed-oil-sized goods that have been treated in hard water. Heavy metal compounds, especially those of copper, iron, manganese and cobalt, various siccatives, and light have a catalytic effect on the auto-

oxidation of linseed oil. The actions of various other substances are discussed and it is pointed out that diphenylamine and α- and β-naphthol retard the oxidation and prevent spontaneous ignition of goods sized with linseed oil. (C)

METACHROME METHOD OF DYEING: DISCUSSION OF THE. C. H. A. Schmitt. *Am. Dye. Rptr.*, June 26, 1939, P. 336–41. (C)

MOLECULAR WEIGHTS IN RELATION TO DYESTUFFS. O. A. Battista and W. D. Johnston. *Canadian Text. J.*, Aug. 4, 1939, P. 29–30, 34.

This paper discusses methods to bring about molecular weight changes, and gives general rules for color prediction.

When the constitution of a dyestuff has been determined, the shade may then be altered by decreasing or increasing the molecular weight or by rearranging the positions of certain radicals in the molecule. (C)

MORDANTS: DETECTION ON DYED MATERIALS. A. Rehmann. *Leipz. Monats. Text. Ind.*, 1938, V. 53, P. 343–5; abs. in *J. T. I.*, April 1939, P. A241.

The author describes simple tests for the detection of mordants on dyed materials, for the detection of Turkey red, alizarin and indigo dyeings, for distinguishing between alizarin-dyed and alizarin-topped red dyeings, and for determining the type of dye on black samples. (C)

NAPHTHOL AS-TYPE DYES: CHEMICAL CONSTITUTION OF THE. Kenneth L. Dorman. *Am. Dye. Rptr.*, Feb. 20, 1939, P. 79–84, 101–6. (C)

"NEOCOTON" DYES: APPLICATION. C. Gränacher and F. Reichart. *Mell. Textilber.*, 1939, V. 20, P. 288–91.

Developments in ice colors are reviewed and the disadvantages of processes depending on production of the dye on the fibre are pointed out. The Neocoton dyes are azo dye and other suitable insoluble pigments which have been rendered soluble by a special treatment. They may be fixed on textile materials by applying by printing or dyeing methods and then treating with alkali which splits off the solubilizing group and regenerates the original insoluble pigment. These dyes may be mixed and may also be used in combination with vat dyes in printing, the steaming treatment required for fixing being the same as that required for vat dyes. (C)

ONE-BATH METHOD FOR SCOURING AND DYEING RAYON KNIT GOODS SAVES TIME AND MONEY. George I. Putnam. *Text. Wld.*, April 1939, P. 89.

Use of lubricating compounds which are easily scoured out has eliminated the problem of oil removal and made it possible satisfactorily to scour and dye rayon knit goods by the one-bath method. (C)

ORGANIC CHEMICAL DEVELOPMENTS: RECENT. M. A. Dahlen. *Am. Dye. Rptr.*, June 12, 1939, P. 315–9.

Paper presented at meeting, Piedmont Section, A. A. T. C. C., Greenville, S. C., Feb. 11, 1939. (C)

PACKAGE YARN DYEING. W. A. Travers. *Canadian Text. J.*, May 12, 1939, P. 35–8, 56–7.

Summarizes the history and development of this process, and discusses the advantages and disadvantages common to all machines. (C)

PARTICLE SIZE IN WOOL DYEING. E. Valko. *J. Soc. Dyers Col.*, April 1939, P. 173–82.

The subject of the present paper deals with the results of tests in connection with the dyeing process on wool, but, where necessary, for the sake of completeness, reference is made to some experiments on which reports have already appeared. Results are summarized as follows: (1) Diffusion measurements have been carried out on acid wool dyes in aqueous solution at 25° C., 60° C., and 90° C. The dyes examined are partly dispersed into single ions and partly form aggregates which, in size, however, do not exceed that of three dye ions at 90° C. In general, the aggregation diminishes with increasing temperature, but, in some cases, the aggregation of the dye is larger at 90° C. than at 60° C. (2) The results of diffusion measurements on dye solutions in presence of leveling agents, suggest a distinction between leveling agents with affinity for the fibre and those with affinity for the dye. In the latter case, if the concentration of the dye is reduced, but that of the leveling agent maintained, the diffusion speed is always reduced strongly. This behavior can only be explained by the assumption of mass action in the form of a combination of dye molecules and leveling agent molecules. (3) The importance of the non-electric attraction forces and particularly the formation of hydrogen bonds between the dye and the keratin molecule is emphasized, in order that the molecular process of wool dyeing may be understood. (C)

PERMANENT FINISHING OF CELLULOSIC FABRICS. C. L. Wall. *Text. Mfr.*, 1938, Nov., P. 492–3; Dec., P. 540–1, 546; Jan. 1939, P. 30–1.

A general discussion of the basic factors in the progress toward permanency of finish, and the requirements in actual processing and the routine of processing. (C)

PHOSPHORESCENT AND FLUORESCENT YARNS AND FABRICS: PRODUCTION. F. Defalque. *L'Industrie Text.*, 1939, V. 56, P. 144–5; abs. in *J. T. I.*, June 1939, P. A398. (C)

(MODERN) PRINTING. G. Hasse. *J. Soc. Dyers Col.*, Jan. 1939, P. 6–11.

The printing methods discussed are those which technical and commercial influences during the last 10 years have made most popular and profitable. (C)

RAYON: DAMAGE IN BLEACHING. EFFECT ON STRENGTH AND EXTENSIBILITY. H. Bach. *Kunstseide*, 1938, V. 20, P. 302–5, 402–5, 433–7; 1939, V. 21, P. 109–12; abs. in *J. T. I.*, June 1939, P. A394. (C)

ROT-PROOFING OF TEXTILES. S. G. Barker. *Text. Col.*, April 1939, P. 233–5, 276; May, P. 330–2, 348; reprinted from *The Dyer and Textile Printer*.

Paper read before a meeting of the Food Group, Microbiological Panel of the Society of Chemical Industry and reported in *Chemistry and Industry*. (C)

SILK PIECE GOODS: HYDROGEN PEROXIDE BLEACHING. F. Weber. *Mell. Textilber.*, 1939, V. 20, P. 209–10, 282–4. (C)

SILK AND RAYON FINISHING: DEVELOPMENTS. R. J. Smith. *J. Soc. Dyers Col.*, May 1939, P. 247–50.

A summary of the various new finishes, with especial emphasis on those of the most permanent character. (C)

SHRINKING AND SHRINKLESS FINISH: NATURE OF. H. Rath. *Mell. Textilber.*, 1939, No. 7, P. 497–502.

Up to the present time, mechanical methods have chiefly been used for the shrinkless finish, but recent developments show that the possibility of making use of chemical processes must be seriously considered. The swelling of the fibre imparts life to the structure of the yarn and the fabric; acting in conjunction with the effect of the washing liquor in reducing friction and the opening up action of its movement and that of the goods it assists in balancing the latent tensions present in the yarn and the fabric. Swelling of the fibre leads to changes in the length of the fibres and the yarn, but chiefly to deformation of the thread, causing the points of interlacing to move closer together. The changes in the length of the fibres following swelling and drying are not concerned to any considerable extent in increasing the extent of shrinkage, unless in the case of fibres that are subjected to severe mechanical and chemical action; they are brought out chiefly in rayon and staple fibre goods. The share of each individual factor in the shrinking process as a whole depends on the structure and condition of the fabric. Chemical methods aim at getting rid of the swelling properties of the fibre and thereby freeing the fabric from any tendency to shrink; the mechanical processes are all more or less intended to place the fabric during the finishing process in the condition in which it would be after its first laundrying. Their object is thus to cause the fibre to swell by treatment with moisture and heat, thereby causing the fabric to shrink. (C)

SOAP GOES THROUGH THE MILL. A. E. Hulme. *Text. Recdr.*, May 6, 1939, P. 40–3.

The scientific principles underlying the results of recent researches into the constitution, synthesis and mode of action of detergents, are considered from the following standpoints in a series of articles: (1) Molecular constitution of detergents, (2) constitution of detergent solutions, (3) mechanism of detergent action, (4) efficiency of detergents. (C)

SULFUR AND ITS COMPOUNDS: TEXTILE CHEMISTRY OF. K. Wardle. *Text. Col.*, May 1939, P. 299–302, 348. (C)

SULPHONATED SATURATED HYDROCARBONS AS TEXTILE ASSISTANTS. Hanns Gerber. *Mell. Textilber.* (German Edition), 1939, No. 4, P. 294.

Cotton can be conditioned in a technically perfect manner by treatment with highly sulphonated saturated hydrocarbons, which have unrivalled wetting properties, because the intensive wetting effect remains completely unaltered at all temperatures that come into consideration. The wetting effect of these products ensures that the moistening water is rapidly distributed everywhere in a uniform manner. The absorbent properties of goods pretreated with these products are enhanced and swelling

and shrinkage of the fibre are reduced, providing favorable conditions for the production of level dyeings and good penetration. (C)

SULPHUR STOVING: CHEMICAL EXPLANATION OF. *Text. Mfr.*, July 1939, P. 321.

The bleaching of wool by sulphur dioxide may arise from the destruction of disulphide linkages, explaining some of the effects noted in practice. (C)

IV. RESEARCH METHODS AND APPARATUS

DYED OR PRINTED COTTON: GROUP C-FASTNESS TESTS FOR. I. FASTNESS TO LAUNDERING OR DOMESTIC WASHING OF DYED OR PRINTED COTTON (WITH LAUNDER-OMETER). *Am. Dye. Rptr.*, June 12, 1939, P. 312–4.

The A. A. T. C. C. Committee on "Fastness to Washing of Dyed Cotton Material" has, during the past year, been making a re-study of the official methods for Fastness to Washing of Dyed Cotton Material which were accepted by the Association several years ago. As a result of co-operation with different interests a number of changes have been made and it is believed that as now published it is generally acceptable to practically all interested organizations. Prof. L. A. Olney, Chairman, Research Committee, requests that any suggestions or criticisms of this newly published method and series of standards be sent to Mr. George A. Moran, Calco Chemical Co., Bound Brook, N. J., who is Chairman of the Committee. (C)

FIBRE STRENGTH: DIAL READING APPARATUS FOR DETERMINATION OF. S. S. Sukthanker, N. Ahmad and H. Navkal. Indian Central Cotton Committee Technological Laboratory *Tech. Bull. Series B, No. 26*, Feb. 1929, 16 pp.

The paper describes and illustrates an apparatus designed by the authors for measuring the strength of textile fibres. A fibre is suspended from a hook fixed to a lever arrangement in which an electric circuit is completed as soon as the fibre is straightened out. The other end of the fibre is attached to a float suspended in a solution of calcium chloride contained in a U-tube. The tension on the fibre is applied by raising a counterpoise suspended from a string in the second arm of the U-tube. As this counterpoise is gradually raised the level of the liquid surrounding the float falls and the pull on the fibre increases steadily until it breaks, when the float which had hitherto been held by the fibre drops in the U-tube. The counterpoise is raised by winding the string on a pulley, which is driven by a gear arrangement from a small electric motor. The same gear records the tension applied to the fibre on two calibrated dials, in units and hundreds. The arrangement for applying and recording the tension is connected to the electric circuit referred to and works only so long as the circuit is complete. As soon as the fibre breaks, the electric circuit is interrupted and both the pointer and the counterpoise come to rest. The mean values obtained with this apparatus for cottons are given together with those obtained by Balls' Magazine Hair Tester. It is found that the agreement between the two sets of values is good. In addition to being accurate, this apparatus is quick in action, while the costs of construction and maintenance are quite low. (C)

FLOW RELATIONS OF THERMOPLASTIC MATERIALS. C. H. Penning and L. W. A. Meyers. *Brit. Plastics*, Sept. 1938, V. 10, P. 191–2, 195; abs. in *Eastman Kodak Abs. Bull.*, Feb. 1939, P. 109.

Using the Olsen Flow Tester under specified conditions, the authors have classified commercial thermoplastic material made by the Tennessee Eastman Corporation in degrees of hardness by finding the temperature at which one-inch flow is obtained in two minutes under a pressure of 1500 pounds per square inch. (S)

HOSIERY TESTING METHODS ANSWER LABORATORY NEEDS. E. N. Ditton. *Text. Age*, Jan. 1939, P. 32–5. (C)

IODOMETRIC DETERMINATION OF OXYCELLULOSE. P. V. Moryganov and E. I. Vlasyuk. *J. Applied Chem.* (*U.S.S.R.*), 1938, V. 11, P. 711–8; abs. in *Paper Trade J.*, July 27, 1939, P. 25.

The iodometric method was used to determine the degree of decomposition of cotton by bleaching. The material (4 grams) was refluxed with 100 cc. of 1% sodium hydroxide for one hour, cooled, filtered and 32 cc. of the filtrate mixed with 10 cc. of 0.05*N* iodine in 50 cc. of water. After 20 minutes, the solution was acidified with 20 cc. of 2% hydrochloric acid and unchanged iodine was back-titrated with 0.05*N* sodium thiosulphate. The results showed that hydrochlorite continually oxidized the cellulose of cotton, although at a decreasing rate. The above alkaline extract may also be used for the determination of the carboxyl groups, approximate results being obtained by a series of three titrations. (C)

MATCHING TO SAMPLE. *Text. Recdr.*, May 6, 1939, P. 45–6.

The use of Pulfrich Photometer in the matching or evaluating of textiles for gloss and color is described. (C)

MEAN FINENESS OF WOOL AND STANDARD DEVIATION: NOTE ON RELATION BETWEEN. H. J. Henning. *14th Int. Wool Conference, London*, 1938, *Tech. Cttee. Proc.*, P. 66–9; abs. in *J. T. I.*, April 1939, P. A258. (C)

MERCERIZING FAULTS: USE OF THE IODINE SORPTION NUMBER AS PROOF OF MERCERIZATION AND AS AN AID FOR THE DETECTION OF. Karl Schwertassek, K. Heidler and Josef Kasche. *Mell. Textilber.*, 1939, No. 6, P. 433–6. (C).

MICROSCOPICAL ANALYSIS OF MIXED TEXTILE FIBRES. Fred A. Mennerich. *Rayon Text. Mo.*, Mar. 1939, P. 62–3.

The microscopical analysis of mixed textile fibres as set forth in this paper describes a scientifically correct method. The analysis of one sample requires about 15 minutes for mounting, 20 minutes for counting, 15 minutes for measuring and 10 minutes for calculation. At first several hours will be needed, but with enough experience an analysis can be completed in one hour. (C)

MOISTURE CONTENT CONTROL. Anon. *Am. Wool & Cotton Rptr.*, July 27, 1939, P. 31, 35.

Describes apparatus developed by the Barber-Colman Co., Rockford, Ill., for the scientific indicating, recording and controlling of moisture con-

tent in warps and cloth as they emerge from slashers or tenters respectively. They operate on the electrical resistance principle. As the material passes between a pair of electrodes any variation in resistance as a result of moisture content is recorded in percentage of region. The moisture content controller, through this same set of electrodes, regulates the temperature or speed of the dryer. The moisture content of warps or cloth is said to be held within limits of ¼ to ½ of 1% regain. (C)

NUMBERS: ESTIMATING—WITHOUT COUNTING. A. C. Hardy. *Nature*, Aug. 6, 1938, P. 255–6; abs. in *Eastman Kodak Abs. Bull.*, Feb. 1939, P. 106.

The number of specimens in a given field may be estimated within ± 10% by a comparison with similar fields containing known numbers of dots. A sliding scale of standard fields has been found to be very convenient. (S)

NYLON FIBRE: IDENTIFICATION OF. W. Weltzien and E. Pyhrr. *Seide u. Kunstseide*, 1939, V. 44, P. 102–4; abs. in *J. Soc. Dyers Col.*, June 1939, P. 333.

Although viscose and cuprammonium rayons burn readily and leave a loose ash, both natural silk and Nylon fibre burn with difficulty and leave a bead-shaped residue, so that the behavior of Nylon fibre on burning is not characteristic. PC fibre (IG) is a polyvinyl chloride fibre which can be distinguished from Nylon fibre in that it does not form a bead when burnt. Although natural silk and Nylon fibres behave similarly on burning, they can be distinguished by the solubility of the former in hot caustic alkali. Nylon fibre, however, can also be readily identified by its solubility in molten phenol, in which wool, cotton, natural silk, viscose rayon and PC fibre are insoluble. Only cellulose acetate rayon is also soluble in molten phenol, but it can be distinguished from Nylon fibre by its solubility in acetone. (C)

"NYLON" AND ITS IDENTIFICATION. Werner Von Bergen. *Rayon Text. Mo.*, Jan. 1939, P. 53–7. (C)

PHOTOELECTRIC EXPOSURE METER FOR USE IN PHOTOMICROGRAPHY. W. R. Earle. *J. Biol. Phot. Assoc.*, Dec. 1938, P. 54–8; abs. in *Eastman Kodak Abs. Bull.*, Feb. 1939, P. 89.

A photronic cell is mounted on mechanical arms so that it may be swung either over the ground glass or to one side where it is covered with a shield. The galvanometer is a 5-second period, reflecting-type mounted on the wall. The method of calibration is described. (S)

PHYSICAL AND CHEMICAL TEXTILE TESTING. XIV, PART II. CHEMICAL TESTING. CHAP. 13. SWELLING AND DAMAGE IN CELLULOSE FIBRES. John H. Skinkle. *Am. Dye. Rptr.*, June 12, 1939, P. 307–10, 324–5; XV, PART II. CHEMICAL TESTING. CHAP. 14, DAMAGE TO WOOL; CHAP. 15, DAMAGE TO SILK. *Ibid.*, July 10, 1939, P. 357–8, 371–5. (C)

PHYSICS IN THE TEXTILE INDUSTRIES. *Text. Mfr.*, April 1939, P. 174–6.

Summary of papers and discussions at the conference (Mar. 24, 1939) of the Institute of Physics at Leeds (Eng.) Univ. The subjects covered

included surveys of humidity in relation to textiles, control of conditions and processes and color, with particular reference to discharge lighting and fluorescent carbon-dioxide daylight lamps. (C)

V. Pure Science, Economics and Misc.

Micellar Structure of Cellulose. O. Kratky and F. Schoszberger. *Z. physik. Chem. B.*, April 1938, P. 145–54; abs. in *Paper Trade J.*, Mar. 2, 1939, P. 26.

Ramie fibres soaked in gold chloride solution and then exposed to ultraviolet light received deposits of reduced gold in particle-forming chains of the order of 100 A long, but only one or two atoms broad. Such fibres used in X-ray investigations exhibit an increase in the usual cellulose interference pattern by about 100% and an increase in the intensity of blackening around the central beam of 100–200%. This change is reversed by dissolving out the gold. The data are intepreted in terms of a periodicity in the structure of the cellulose fibre. (C)

Mold and Bacteria Damage in the Textile and Allied Industries. W. A. Stringfellow. *Am. Dye. Rptr.*, July 24, 1939, P. 388–90. (C)

Moths and Mothproofing. C. S. Whewell. *Text. Col.*, Feb. 1939, P. 122–4, 126; reprinted from *The Dyer & Textile Printer.*

The author holds that there is still need for development of cheap and effective processes, although chromium fluoride method is promising. (C)

Neutral Salt Solutions of Cellulose. H. Erbring and H. Geinitz. *Kolloid-Z.*, July 1938, P. 25–42; abs. in *Paper Trade J.*, July 27, 1939, P. 25. (C)

Organization and Integration of Research and Testing. G. E. Hopkins. *Text. Wld.*, Annual, 1939, P. 103–5.

Integration of the research development and testing responsibilities of a textile mill under a single technical organization is discussed under four headings: What activities shall be included? How shall the functions of the technical department be tied in with those of the purchasing, manufacturing, sales, and cost departments? Why it is better to segregate these functions. How shall such a department be organized? Organization charts are given for a small and a large textile technical department. (C)

Photomicrography: Rise of a Technique. B. M. Belin. *Bull. Soc. fran. Phot.*, July 1938, P. 117–20; abs. in *Eastman Kodak Abs. Bull.*, Feb. 1939, P. 84.

The article is the first installment of a nonmechanical history of the microscope. Some of the preliminary and unsuccessful forms of the instrument are described. (S)